



Automated and Connected Vehicles

How Technology Will Change Transportation

December 4, 2017

The Future of Transportation



The Future of Transportation

ACES

Automated/Connected



Electric



Shared



Transportation's New Reality

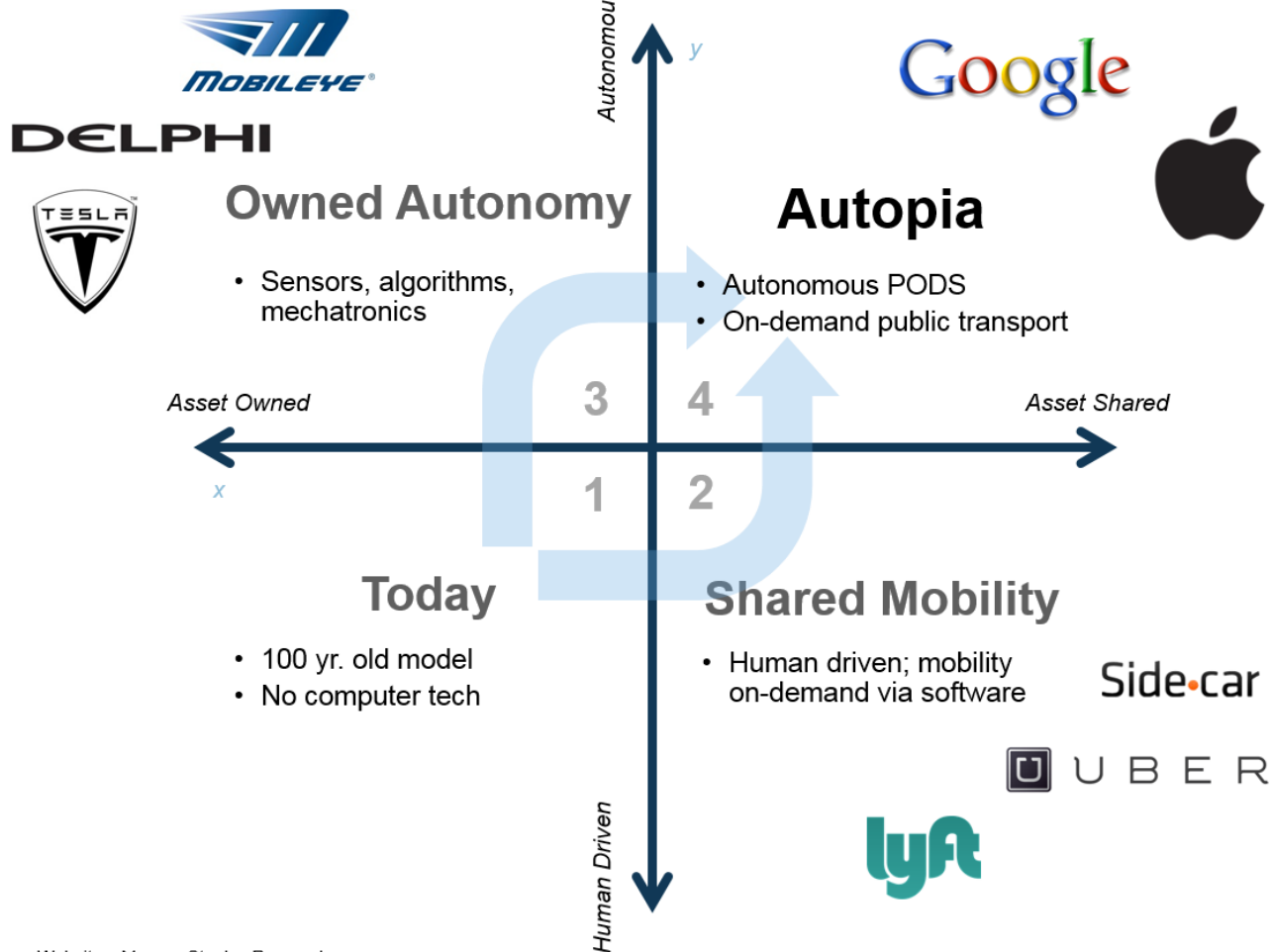
The Changing Expectations of our Consumers

- View transportation as a service
 - Reliable
 - Safe
- Want Convenience
 - On Demand
 - Point to point
 - High Tech
 - Personalized
- Environmentally Friendly
 - Shared
 - Electric



Transportation in Transition

Morgan Stanley



Company Websites, Morgan Stanley Research

Connected vs Autonomous

- Connected



- Autonomous



Connected Vehicle Technology

Information Exchange Platforms

- Dedicated Short Range Communications (DSRC)
- Cellular
- Satellite

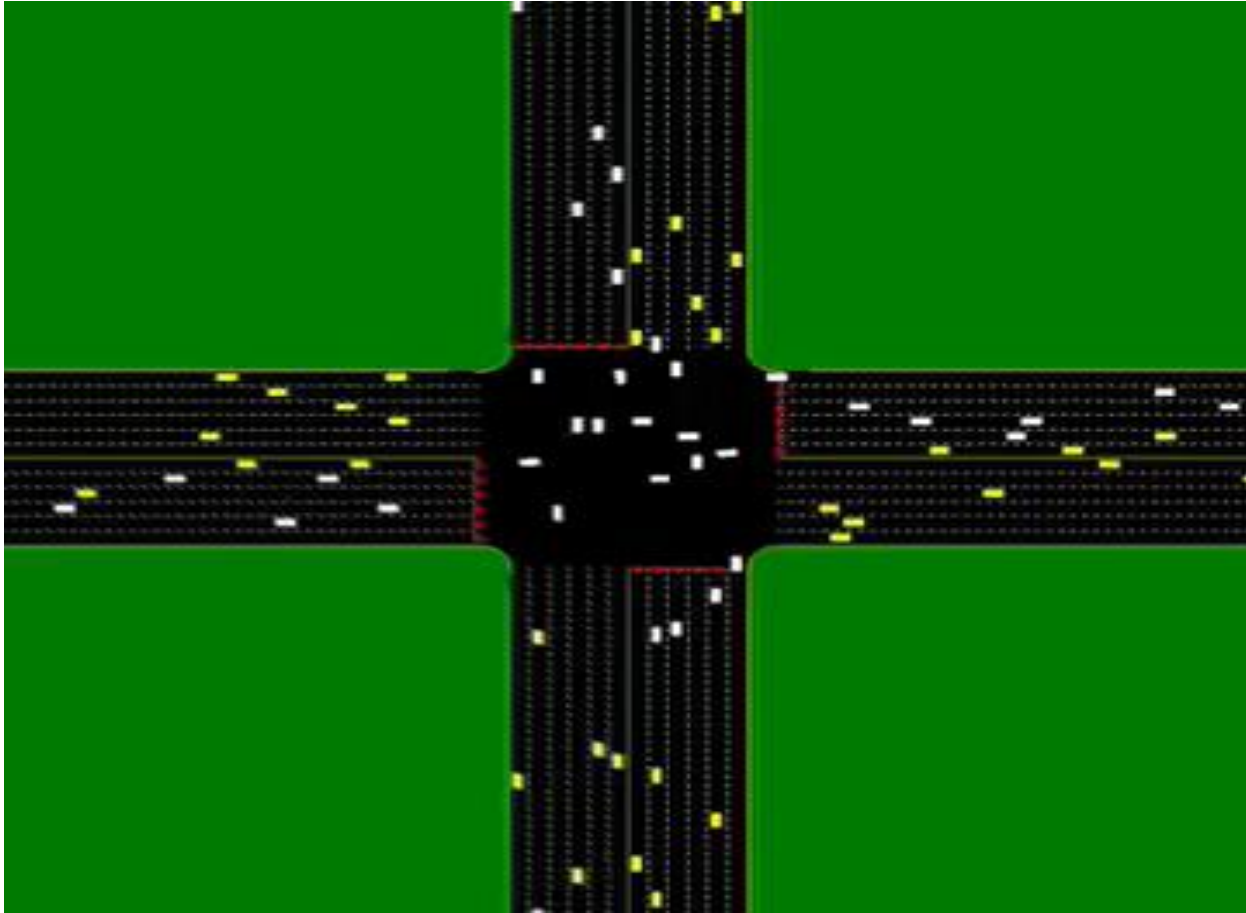


Information Exchange by System

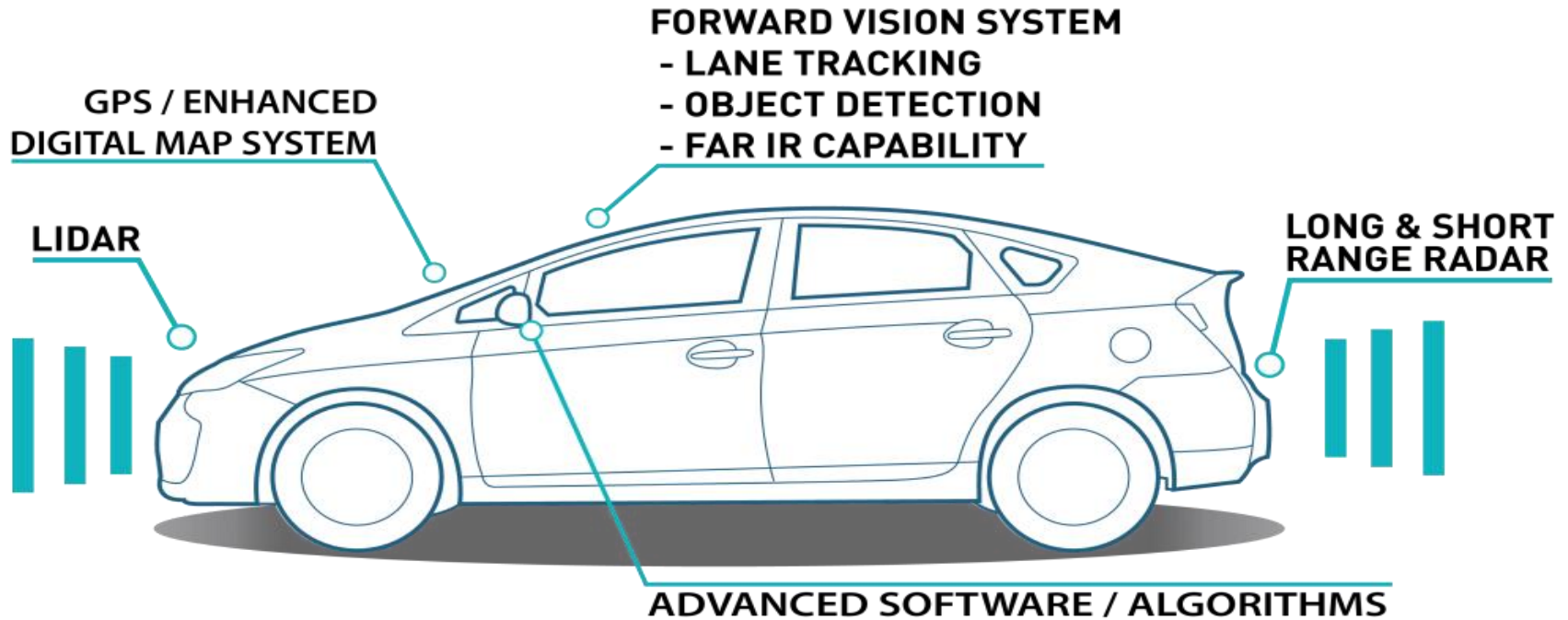
- Vehicle to Infrastructure (V2I)
- Vehicle to Vehicle (V2V)
- Vehicle to Bike/Ped/Other (V2X)



Connected Vehicle Technology



Autonomous Vehicles



Safety critical functions of the vehicle (steering/throttle) *are affected* without direct driver input

Autonomous Vehicle Deployment

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the dynamic driving task with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

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Advantage North Carolina

- NCTA test track designation
- Research Triangle
- University Concentration



Additional Resources

- Clean Disruption-Why Conventional Energy and Transportation will be Obsolete by 2030 by Tony Seba - Stanford University
 - <https://www.youtube.com/watch?v=Kxryv2XrnqM&app=desktop>
- 2016 Automotive World Congress Presentation by Adam Jonas - Morgan Stanley Financial
 - https://www.youtube.com/watch?v=xwg_XwQe-UI
- Solar Roadways
 - <http://www.solarroadways.com/Home/Index>

Questions

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